Good Morning!

Department of Fire Services
Massachusetts Firefighting Academy

Instructors

- Asst. Chief John J. O'Donoghue
- Cambridge Fire Department (Ret)

- District Chief Ken O'Donnell
- Boston Fire Department

Handouts/CD-ROM

- Class Agenda sheet-
- Power Point-2011-set 1 and set 2
- SOG 15 Set (3) (CD-ROM)
- MBER Memo-9/7/10
- Suggested Operational Guidelines (LOTO)
- Other selected articles

NEVER FORGET!

111 stops/6000lb capacity/1200 fpm/1362' rise

Otis 339HT Gearless Motor

Photo by Sara K. Schwittek

24 #339HT machines in each tower

Otis 339HT Gearless Motor

Goal:

- To provide a safe environment for firefighters when working near elevator equipment.

Did you Lock out/ Tag out on your last elevator call?

Fire Department Response to a Stalled Elevator

- Staffing must be able to handle an incident.
- At least 6-8 firefighters should be present at the incident.

You don't need these to get into trouble!

This one will do the trick!

Emergency
Elevator Procedures

4 RULES TO FOLLOW!

Emergency Evacuation of an Elevator
Rule # 1

- Whenever possible, leave the occupants in the car until a licensed elevator mechanic arrives.
- They are only locked in a box, and still safe until we arrive and endanger them.
- Typical service contract has a 2 hour response time
- Be patient!

Emergency Evacuation of an Elevator
Rule #2

- **Before** any attempt is made to remove a passenger from an elevator, power must be disconnected at the main power disconnect switch located in the machine room.
- Lock out/ tag out must be performed.
- This rule is not debatable and must be strictly **enforced**.
- This procedure is referred to as "Lock out/ Tag out", and must be **documented**.

Emergency Evacuation of An Elevator
Rule #3

- **Never** move an elevator.
- Only a licensed mechanic should do that procedure.
- The elevator company that showed you how to do it will testify *against* you in court.
- They will deny they ever trained you to do it. Ask them for a letter on company stationary requesting that you do it.
- You will never get it!

Emergency Evacuation of An Elevator
Rule #3

DOCUMENTATION
Rule # 4

- The response must be recorded (NFIRS,etc.)
- FM 3502 for Fighter Service problems
- FM 52E for entrapments/removal of passengers
- Lock out/Tag out must be in writing

INTRODUCING "THE 15'S"

A series of
Standard Operating Guidelines
for the Fire Service.

STANDARD OPERATING GUIDE # 15

Firefighter Service (3502)
Operating Guideline

Fire Floor at Clearwater, Florida Fire

1st. Due companies should NEVER take an elevator directly to the fire floor!

STANDARD OPERATING GUIDE # 15A

Removal of Passengers from a Stalled Elevator

Do you Lock out/Tag out?

STANDARD OPERATING GUIDE # 158

Lock out/tag out Procedures

LOCK OUT/ TAG OUT (LOTO)

- ASME A17.4 Guide for Emergency Personnel (2007 Draft) Safety Code
- IUEC Opinion
- OSHA 1910.147 (b)
- **CMR 524 17.39**

Lock out/tag out-
No Choice-it MUST be done!

DANGER

Lock out/tag out-
No Choice-it MUST be done!

DANGER

524 CMR 17.39(e) (*New*) The fire department shall utilize a Lock-out Tag-out ("LOTO") procedure on the electrical main line power disconnect of the elevator equipment during fire department operations including extrications. A written procedure relative to removal of the lock shall be printed on the affixed LOTO tag to facilitate speedy removal for an incoming Massachusetts licensed elevator mechanic (effective 7/9/10)

Lock out/tag out-
No Choice-it MUST be done!

DANGER

Emergency
Elevator Procedures

The History of Elevators

- **PAST**
- **PRESENT**
- **FUTURE**

Earliest Known Elevator

- The earliest known elevator was in the Coliseum in Rome. It was used to transport the lions, tigers and humans for the entertainment of the Romans.
- The outline of the hoistway still exists to this day.

Mid -Nineteenth Century (1852)

- Until Elisha Otis Elisha Otis at Crystal Palace Fair performed a demonstration of his "Car Safety", elevators were not considered to be a safe means of transportation for people.
- It is still the basis for all car safeties.

The Bird Cage Style Elevator

1970's through today-solid state CPU's

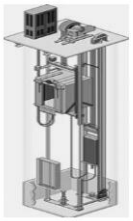
Another Modern Solid-State Controller

- A modern solid state controller, that is air conditioned, dry and clean of any dust or other environmental problems.
- There is absolutely no need for any firefighter to open these cabinets. The only thing that you will find in here is trouble.
- The Main Line Disconnect will be inside of the entrance door of the machine room itself.

Families of Elevators

Traction

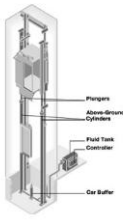
- Geared
- Gearless
- Drum



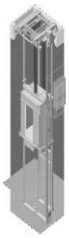
Families of Elevators

Hydraulic

- Holed
- Holeless
- Telescopic
- Roped



Families of Elevators (MRL)

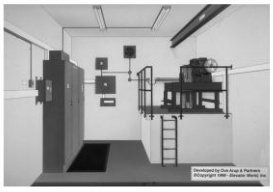


- Coated Steel Belts
- Gearless Machine
- Governor
- Controller

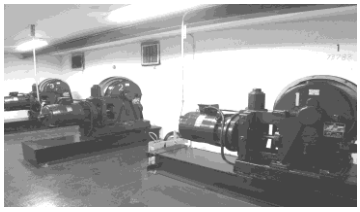
Otis GeN-2

A TOUR OF THE HOISTWAY

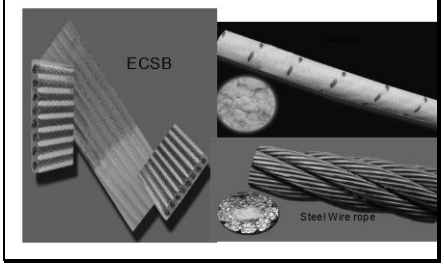
Machine Room to the Pit



Geared machine installation



Hoist Rope Variety



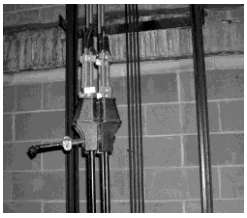
The Elevator Hoistway

Good View / Car System and Equipment

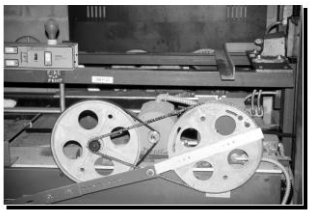
Car attachments

- Counterweights are known as "Silent Death" in the elevator industry.
- This man died, and we will examine his accident later.

View of Shackles attachment–Ropes to Car



Car Door Operator Motor and Assembly



Car Top Equipment

- Inspection box
- Car door operator
- Guard rail
- 2:1 roping

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Slide Guide

- The slide guide is used on low speed-low rise elevators.

Roller Guide

- The Roller Guide is used on mid and high speed-elevators.

Elevator Car Door

- A modern Elevator car door showing a shoe clutch and LED doorway protection.
- Note the arm extending off to the left!
- It is connected to the Car Door Restrictor.

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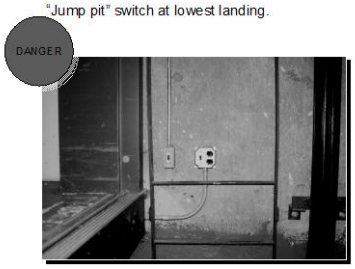
Roller Wheel Guides and Tape Register

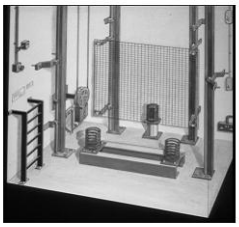
- The elevator rides on a set of roller guides, which attach to the 4 corners of the car. These are actually rubber wheels in this case.
- The tape register (shiny aluminum strap) allows the elevator system to always know where the elevator is in the hoistway.
- Note the black cable- it is the only "cable" in the elevator system.
- It is the half-way line, used for lights and other 110 accessories in the car.

"Jump pit" switch at lowest landing.



The Elevator Pit

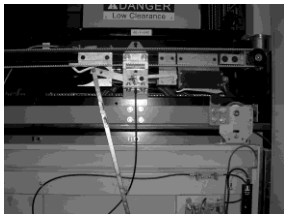
- Members are never to enter a Pit unless car is secured by elevator mechanic.



Hydraulic Buffers

Car door with restrictor

Newer equipment. Note the Lateral Door Opener track belt at top of car door.

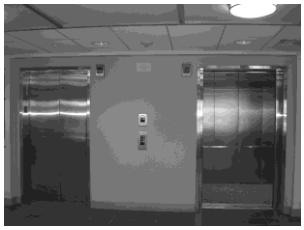


Hoistway door back view from the inside

Equipment includes :
•the door pulley track
• the Interlock lock box
•The keeper

Floor Doors

The final part of the system are the **Hoistway Doors** in the elevator lobby. Always account for all of your cars.

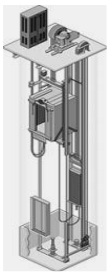


Emergency
Elevator Procedures

DANGER

SAFETY CIRCUIT

System Schematic



Safety Circuit

Geared Passenger System

HALL CALL STATIONS

Mechanical , Electronic
and
Destination Orientated

Floor Call Buttons

Mechanical call button

Mechanical car station
(gang)
push buttons

Electronic Call buttons

The "Touch" Button

Destination Oriented

- Destination oriented traffic management systems.

Otis-Compass

TKE-DCS

Schindler-Miconic-10

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FAID Automatic Recall

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SMOKE AND VANE CLUTCHES

Photo Electric Eyes and Light Emitting Diode's

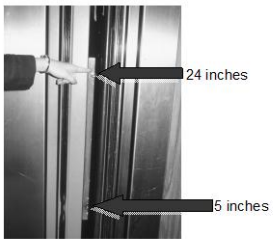
Shoe Clutch and LED Door Protection

- A modern elevator door showing a shoe clutch and LED protection .

LED door protection.
(Light Emitting Diode)

Full doorway opening coverage

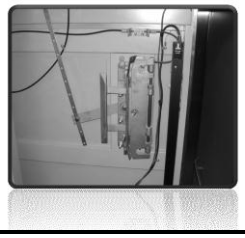
Older Style of Photo Electric Eye



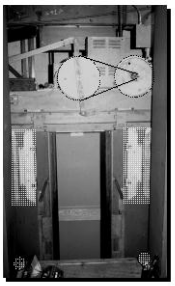
Mirror on opposite side of door opening

SHOE CLUTCH

The Shoe clutch is the most common type of clutch installed. The clutch would cover the release rollers attached to the back of the Hoistway Door, and then be used by the **Car Top Door Operator** to open the door.



Vane Clutch



Note:
- 2 shoe clutches
- Car door operator
- Crosshead beam
- Screw drivers in door tracks

MACHINE ROOM

Contents and Locations

Machine Room Contents

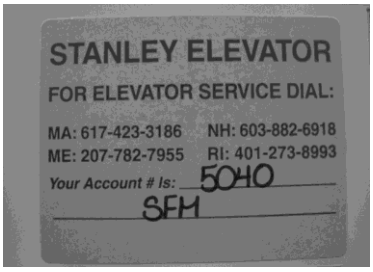
- Power Disconnects
- LOTO Procedure
- Precautions to be taken
- Controller
- Hoistway Vent Exchange Opening

Power in the Machine Room.

Where is the machine room?

Deep in the bowels of building .

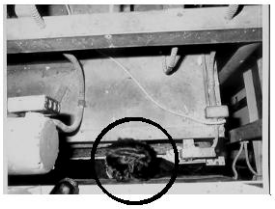
Basement Drum Machine



Lock out/tag out-
No Choice-it MUST be done!

Fatality

Traumatic asphyxia



Lock out/tag out

DANGER

Lock out/tag out-
No Choice-it MUST be done!

DANGER

Sometimes finding the
Machine Room is half the battle.

Stairway to the roof

CAUTION!

Roofs are dangerous places.

Watch your footing and the edge of the roof.

Did you Bring the BIG Eight?

1.Flathead axe
2 Halligan Bar
3.Light
4.Radio
5.Lock out/Tag out
6. Poling Tool
7. Hoistway Door Keys
8. Rabbit tool

Winter Hazards!

DANGER- At night, where is your light?

- It would be very easy to walk off the edge of this roof in the best of weather.
- What about *ICE*?

GEARED AND GEARLESS

Traction Machines

Power in the Machine Room.

Main Line Disconnects here.

110 volt disconnects here.

Controller set with Power disconnects

- Note the Main Line power disconnects 18″ from door jamb.

Geared Machine Room-Solid State

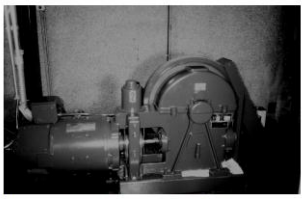
Hoist sheave

Geared Machine

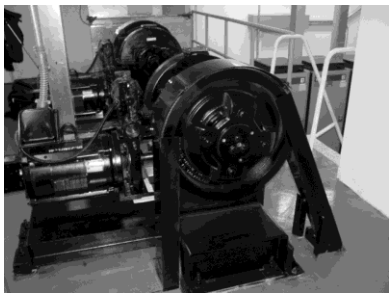
Sheave Wheel

Hoist sheave

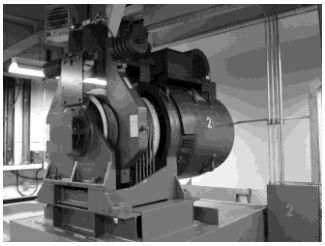
Geared Machine



Motor/generator Brake assembly Worm and gear

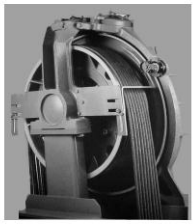


Gearless Machine-The Present



Gearless Machine-Today

- This is a KONE Gearless Overhead PSPM machine for high rise (36+ stops) installations.

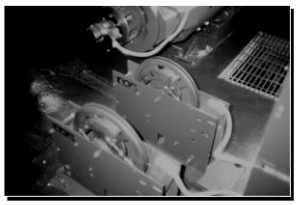


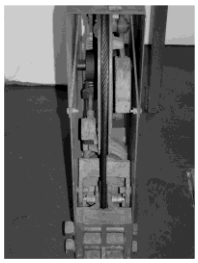
Similar Solid State Machine Room

Large, well lit and clean machine room.

Hoistway vent exchange opening

Governor sheave wheel





Governor Sheave

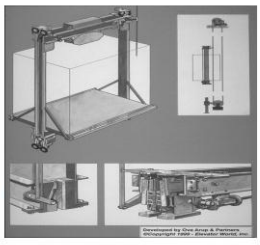
Tightening sheave

CAR SAFETY SYSTEMS

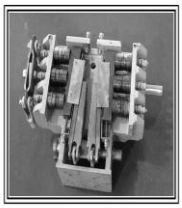
Gradual or Instantaneous

Car Safeties-

- Car sling
- Governor loop
- Car safety
- Safety Plank and attached car safeties



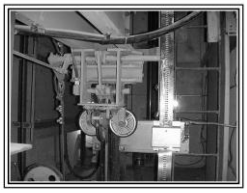
Car Safety Device Jaws



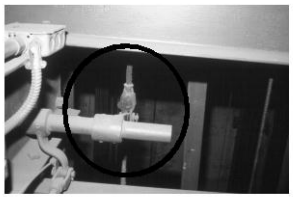
- The steel jaws of the Car Safety Device will grasp the guide rail like a vice, and bring the car to a safe but violent stop.
- There are two types of Safeties-Instantaneous and Gradual.

Car Safety Device

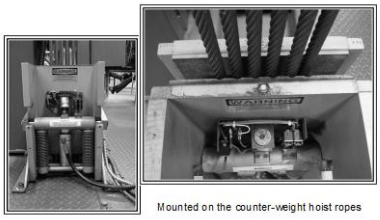
- Car Safety Device is mounted on the Safety Plank.
- It is the strongest piece of steel in the entire installation.
- All of the stresses created by the Emergency Stop will be absorbed by the strength of the Safety Plank.
- Also shown are the Roller Guide Wheels, the tape register and the pit ladder access.



Car safety device actuating arm and governor rope

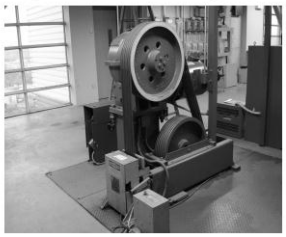


Up Direction Rope-Grippers



Mounted on the counter-weight hoist ropes

Up Direction Rope Safeties

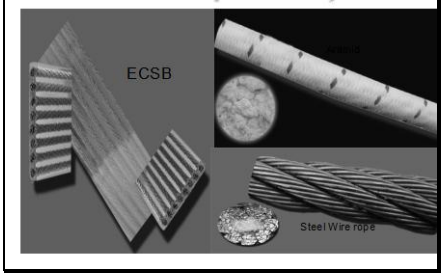


Activated mechanically and reset is hydraulic

Mounted on the car hoist ropes

The Machine Room-less Elevators-(MRL)

Hoist Rope Variety



KONE "Monospace" Pilot (E7)

- The first MRL in MA was located in the closed quarters of Engine Company # 7 of the Cambridge Fire Department. It is now "The Kendall Inn".

MRL Identification in Lobby

Machine Room-less Elevators (MRL)

- The typical penthouse is gone
- All drive machinery located *in* the hoistway
- Main line disconnect in control closet/space/room
- Closet/space/room may be on top floor
- Control Room Door is locked by company key
- Arrange for key to be in Knox box or Gamewell

The MRL Family

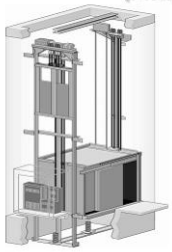
- Otis-*GeN2* –machine in the overhead of hoistway
- **ThyssenKrupp-*ISIS*-1 machine is located in the pit.**
- **(Now out of production) ISIS 2 is also out of production, but will return as the "Time" machine.**
- Fujitec-*Talon*-machine is in the overhead of hoistway
- KONE-*Monospace*-machine under guide rail at top floor
- Schindler 400A-machine is located in the overhead

Otis Machine room-less elevator (MRL)

- Coated Steel Belts
- Gearless Machine
- Governor
- Controller

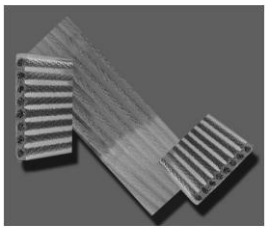
- Otis GeN-2

Otis Machine room-less elevator (MRL)

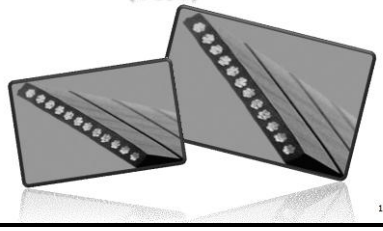


- Otis GeN-2L
- Targeted for replacement of existing hydraulic units

Otis GeN2 Elastomeric Coated Steel Belts

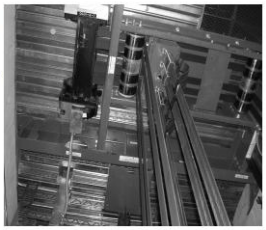


Otis GeN2 Elastomeric Coated (PU) Steel Belts (ECSB)



Otis GeN2 in position

- The belts are Polyurethane zinc-coated steel wire in a flat or laid out manner rather than twisted wire rope.



GeN2 Front View

The Fire!

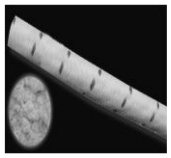
Dynetech Building Orlando, Florida

11/2/07

Otis GeN2 ECSB burning in Orlando

- The belts are Poly-urethane coated steel wire in a flat or laid out manner rather than twisted wire rope.

ISIS Aramid Rope-" "K"- Rope



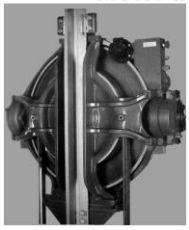
Removed from market
due to catastrophic failures in the field.

Normal Steel Wire Rope

KONE "Monospace" MRL

Notice: the machine is located under the guide rail inside the hoistway.

KONE "Monospace" PM motor and closet



Schindler Closet / Machine Room

- Remember, that except for the Pilot installations around MA (25), they are in Control Rooms
- It may appear to be a closet door, but it has to be big enough to stand in and safely work on the equipment.

Global-Tardif MRL Closet Controller Fire

There have been 8 recent fires in the controller used for this product.

2 in MA and 6 in Ontario, Canada (3 of those in one day)

Lock out/tag out-
No Choice-it MUST be done!

DANGER

QUESTIONS?

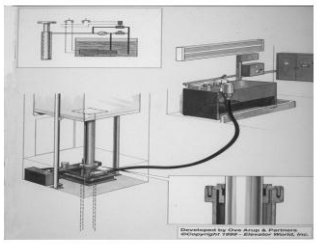
End of Segment # 1

Emergency
Elevator Procedures

Hydraulic Elevator Systems

Nursing Home Hydraulic Elevators

Hydraulic Elevator System



Hydraulic Elevator Systems

- Hole-less variety-no drilling required
- Direct In-Ground-Holed-type drilled down its height
- Cantilever hung
- Platform slung
- Roped assist
- Water driven
- Machine room locations

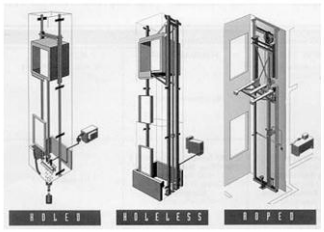
Major Problems

- Hydraulic units bring with them the problems of noise and odor.
- Poor performance in hot and cold environments.
- Environmental impact of hydraulic fluid spills.
- Electrolytic corrosion of single casing cylinders in-ground causing catastrophic collapses. This is not the case with installations that comply with A17.1.
- The cost of pulling those cylinders, inspecting and replacing them. ($60,000)
- 3,000 units per year being replaced (Pre-1972 installations)

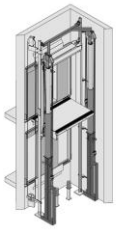
The Big Differences

- No counterweights
- No hoist Ropes (Except. Roped hydraulic)
- No car safety devices
- No Car Safety Plank (**PROBLEM!**)
- Hydraulic fluid supply -200 gallons (average)
- Remote locations of Machine Room
- Usually 6 floors/stops or less

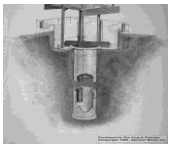
Hydraulic Family of Elevators



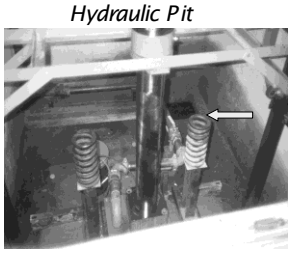
Roped Hydraulic Sheave Wheel

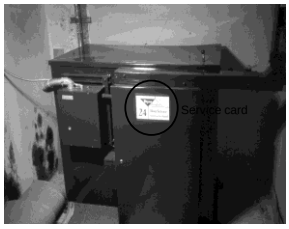


Direct Acting In-Ground Piston

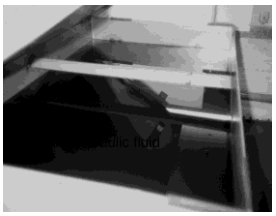


Hydraulic Pit

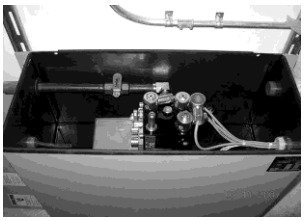


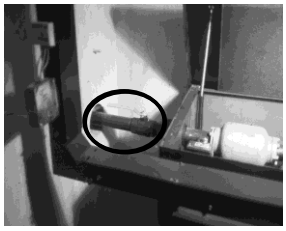


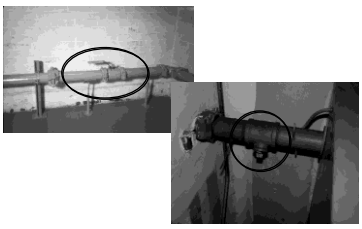
Cover Off!



Pump Unit







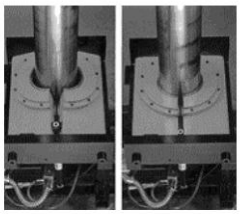
Lock out/tag out-
No Choice-it MUST be done!

DANGER

Resculator

- Many companies manufacture products that will safely lower a hydraulic elevator after checking the safety conditions of the car.
- They eliminate entrapments and repeat calls for extrications.

"Life Jacket" Piston Grabber



Emergency
Elevator Procedures

COMMUNICATIONS SYSTEMS

Fire Alarm Panel
Elevator Status Board
Emergency Power Panel

Fire Command Center

Required in MA by 524 CMR section 780, the high rise building code

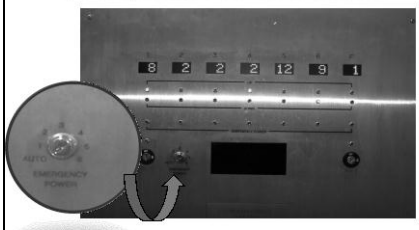
In the Fire Command Room

In the Fire Command Room

EMERGENCY POWER GENERATORS

Required by 524 CMR in buildings 70 feet or higher built after December 31, 1981.(MA)

Emergency Power Selector



Emergency Generator Power

- Will take over after a 25 second drop in Primary power.
- Will select cars following an automatic selection plan.
- One car at a time will be brought to the DL or AL.

- If selected car does not move after 25 seconds, it moves on to next car.
- Full load (weight) capability.
- May move at a reduced rate of speed.

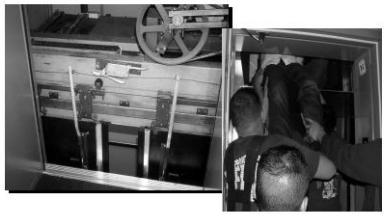
Modern in-car systems

Press button for help and await return response

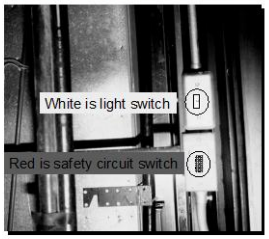
Emergency
Elevator Procedures

Emergency Exits

No safe exit here



Uppermost and Lowest Floors



The Car top-danger area!

DANGER

Car top emergency exit

DANGER

View showing light baffles

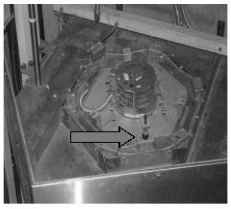
DANGER

Note the wing nuts on corners

Corner Exits

Circular Emergency Exit

- Safety Circuit Plug



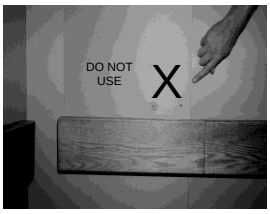
Other views of emergency exits

Hyatt Regency at FDIC-Indianapolis

- There will be no emergency exits from the top of the car in atrium hoistways
- Unless cars are enclosed in a glass hoistway.

Fatal Accident

Side exit - no longer allowed



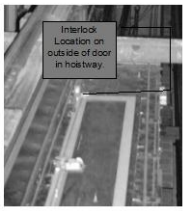
Side-Exit Doors

- Forbidden by Elevator Code Today.

Picture is looking UP the hoistway

Side-Exit Doors.

- Side-exit doors were protected by an interlock located at the top of the door.
- They failed numerous times, causing them to be banned.



This young man received no x-rays at the local hospital, and nothing in a suit against the city fire department involved or the elevator service company

Lock out/tag out-
No Choice-it MUST be done!

DANGER

Emergency
Elevator Procedures

End of Segment

Lunch!